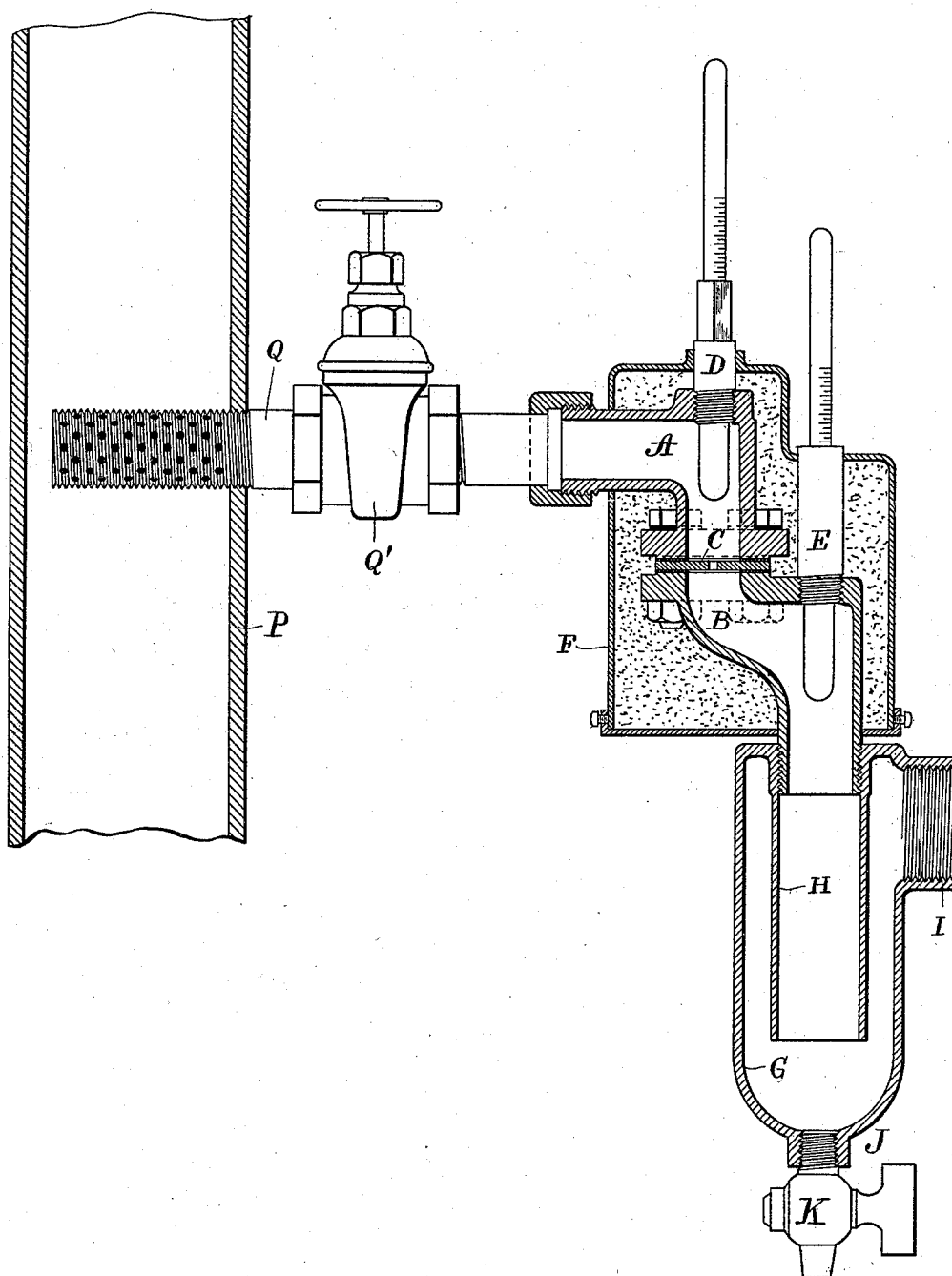


(No Model.)

G. H. BARRUS.
STEAM CALORIMETER.

No. 550,814.

Patented Dec. 3, 1895.



WITNESSES:

A. D. Hanson

Rollin A. Bell

INVENTOR:

Geo. H. Barrus
by Wright Brown & Quincy
Atty

UNITED STATES PATENT OFFICE.

GEORGE H. BARRUS, OF BOSTON, ASSIGNOR OF ONE-HALF TO E. H. GOWING,
OF READING, MASSACHUSETTS.

STEAM-CALORIMETER.

SPECIFICATION forming part of Letters Patent No. 550,814, dated December 3, 1895.

Application filed June 14, 1895. Serial No. 552,760. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. BARRUS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Calorimeters, of which the following is a specification.

My invention relates to the improved steam-calorimeter for which Letters Patent of the United States No. 401,111 were granted to me April 9, 1889.

The present invention has for its object to provide an apparatus of simple construction and capable of being more easily and conveniently operated for the purpose of determining the quantity of moisture in wet steam than the embodiment of my invention shown in the above-mentioned patent.

The improvement relates especially to the arrangement and location of the drip-chamber or separator with reference to the heat-measuring or wire-drawing portion of the calorimeter.

The construction and method of operation will be understood by reference to the appended drawing, which forms a part of this specification and represents a sectional view of said apparatus.

The apparatus consists of two parts, one the heat-measuring or wire-drawing device and the other a drip-chamber or separator.

The heat-measuring device consists of the chambers A and B, the wire-drawing diaphragm C, with its insulating material, and the two thermometer-cups D and E. The said device, in its general features, is substantially the same as that described in my previous patent, No. 401,111. It is here represented with a protecting covering F, within which the non-conducting material is placed which protects the apparatus from radiation; but this has no important bearing on my invention.

In carrying out my present invention I connect the heat-measuring device directly with the main service-pipe P, which conducts steam from the boiler, a pipe Q being connected with the chamber A and inserted in the service-pipe, said pipe Q having numerous small perforations within the service-pipe and a supply-valve Q' between the service-pipe and the chamber A. The steam therefore passes di-

rectly from the service-pipe to the heat-measuring device. The drip-chamber or separator is attached to the outlet of the heat-measurer, its object being to separate from the steam whatever moisture remains therein when the steam to be tested is excessively wet and the heat-measurer fails to handle all the moisture. This, it may be explained, occurs in cases where the percentage of moisture under ordinary pressures is in excess of three or four percent. The separator consists of the chamber G, containing an interior inlet-tube H, which extends nearly to the bottom of said chamber. The outlet I of the chamber is located at a point as near as possible to the top. The stream of entering steam and water passes down through the inner tube to the bottom of the chamber. Arriving at this point its direction of motion is reversed, the particles of moisture being therefore caused to separate themselves by gravity from the steam, so that the waste steam after having thus been dried passes away through the outlet I. The moisture separated from the steam collects in the lower part of the chamber G and the resulting water escapes through the drip-nozzle J. Said nozzle is provided with a valve K to prevent the escape of unnecessary vapor, the valve being adjusted to form a contracted outlet-opening that will be filled by the escaping water, so that there will be practically no escape of vapor through said outlet. The pressure in the chamber G is but a very slight amount above that of the surrounding atmosphere, and no regulation of the escaping water is required except that which is necessary to prevent the vapor loss noted. There are various forms in which this separating device can be arranged, and I do not limit my invention to the arrangement here shown.

The water which escapes from the drip-nozzle is collected in a receptacle (not shown) and its quantity is determined by weighing. This quantity is corrected for the water produced by loss from radiation, and the proportion which the corrected quantity bears to the total weight of steam and water passing through in a given time forms a measure of the quantity of moisture which is contained in the steam leaving the heat-measurer. The percentage of moisture obtained in this man-

ner from the separator measurement, added to that obtained from the readings of the thermometers attached to the heat-measuring device, as pointed out in the specification of my Patent No. 401,111, makes up the total percentage of moisture which is sought.

The principal advantage of my improved apparatus over that described in my previous patent is the ease with which it is operated. In the apparatus as heretofore constructed the drip-chamber was subjected to the full pressure of steam in the main pipe, so that the water therein was discharged from the drip-valve at a varying rate depending upon the steam-pressure. To prevent the escape of the high-pressure steam through the drip-valve it was necessary to constantly maintain a body of water in the drip-chamber, and this necessity required constant attention to and careful regulation of the drip-valve, a water-gage being required, by means of which the level of water in the drip-chamber was indicated to the eye of the attendant. With the new instrument under consideration no such attention is required. The drip-chamber being open to the atmosphere the pressure therein is very nearly atmospheric, so that the water escapes by gravitation, there being no sufficient variations of pressure in the drip-chamber to affect the rate of discharge of the water. There is, therefore, no occasion for the employment of a water-glass and no occasion for frequent regulation of the drip-valve, no attention to the apparatus being required other than the reading of the thermometers and the weighing of the accumulation of water from time to time.

I claim—

1. A steam calorimeter comprising a heat-

measurer or wire-drawing device having means for direct connection with a steam service pipe, and a drip chamber or separator attached to the discharge pipe of the said heat-measurer, said parts being relatively arranged so that the steam is caused to pass first through the heat-measurer and then through the separator, substantially as and for the purpose set forth.

2. A steam calorimeter comprising a heat-measurer or wire-drawing device having means for connection with a steam service pipe, and a drip chamber or separator arranged to receive the steam after its passage through the said heat-measurer, said drip-chamber or separator having an adjustable restricted water outlet, and a free steam outlet open to the atmosphere, substantially as and for the purpose set forth.

3. A steam calorimeter comprising a heat-measurer or wire-drawing device having means for direct connection with a steam service pipe, and a vertical drip chamber or separator arranged to receive the steam after its passage through the said heat-measurer and provided with an interior inlet-tube extending from its upper end nearly to its lower end, an adjustable restricted water outlet at its lower end, and a free steam outlet open to the atmosphere at its upper end, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of June, A. D. 1895.

GEORGE H. BARRUS.

Witnesses:

C. F. BROWN,
A. D. HARRISON.